

Energy Industry comment

CEPS Task Force water use and economical incitaments , March 5 2012
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Comments

- Energy Industry use of water, EPD examples
- Typical numbers in energy industry core process
- Questionmarks around vocabulary:
use, consumption, water management
- Examples of historical settlement between different use of rivers
- Example of taxes and fees

Vattenfall has made EPDs for different electrical generation plants (EPD= environmental Performance Declaration, includes also LCA)

Some Key numbers:

	Unit/kWh	Hydro (Sweden)	Wind (Sweden)	Nuclear (Sweden)	Coal (Denmark)
<i>Water</i>					
Core process consumption	g	0,01	0,06	18	?
Core Infrastructure	g	11	250	11	190
Upstream processes	g	0,05	8	10000	11000
Bypassed water in core process	g	200000-2000000	0	40000	40000
<i>Electricity</i>					
Core process consumption	kWh	0,003	0,005	0,033	0,073

- **1m³/s at 400m head <->3,6 MW_e**
- **1m³ <-> 1kWh_e**
- **1m³, ΔT 8°C <-> 10 kWh**
- **1kWh_e approximately 0,04 €**

5*10¹¹ m³ (DE+BE+NE...)

- **What is water use, water consumption and water service**

- water storage (= change of timing) ?
- head loss = (change of specific energy) ?
- change of temperature ?
- bypass (= change of position) ?

- **Water management**

- Volume management (to what will water be used ?)
- Capacity management (when will water be accessed ?)
(the latter the issue for Energy Industry)

Examples of settlements between different interests in rivers (principles "polluter pays" or "liability for changes of existing use")

Hydro and.....

- Logging - (flume constructions)
- Local social and environmental actions (one time issues and continuous funding)
- Raindeer (extra land passages, restrictions in flow, economical compensation)
- Agriculture - Land use (economical compensation)
- Fish population - (compensating breeding, release of juveniles, passages)
- Sports fishing (new access places, structures in river)
- Process water to other industry – (flow restrictions, special diverting structures)
- Other water users (water level restrictions, extra dams, extra pumping)

All such examples are historically handled in a "water court" to get operational permits ,(today "environmental court") and when economical compensation it is mostly a one time issue and not related to a daily water flow or water volume.

Examples of taxes and fees related to Hydro

- State Property tax
(Vattenfall Sweden 300M€ per year, correlates to 10€ MWh)
- Local social and environmental fund fees
- Fish fund fees (together typical 0,5€ / MWh)
- Electricity tax (production , consumption, VAT)
(total around 40 € / MWh)
- Green certificates payed by consumer (3 € / MWh)
- In addition to these costs are the investment and compensation costs made at permit decision.

Example: Hydro and logging

Log floating during a late stage of construction of the Järkvissle power station on the river Indalsälven. One of the spillways temporarily closed by semi-circular stoplogs.



Stornorrfors- improved hydro power plant and a new fish ladder

Water protection

Stornorrfors, with a generation capacity of 590 MW, is the second-largest hydro power plant in Sweden. The power station is situated by the Ume Älv River, which in turns flows into the unregulated Vindelälven River, in the north of Sweden.

Actions have been undertaken to increase capacity and strengthen the dam in Stornorrfors facility, which aims to generate more electricity as well as improve safety:

- In connection with the old power station, a new small power unit was finalised in 2010, with an installed capacity of 4.7 MW

Actions to reduce the environmental impact from our electricity production in Stornorrfors facility:

- A new fish ladder has been completed in 2010. It is now one of Europe's longest fish ladders and it helps salmon swim upstream every year to reach their breeding grounds.

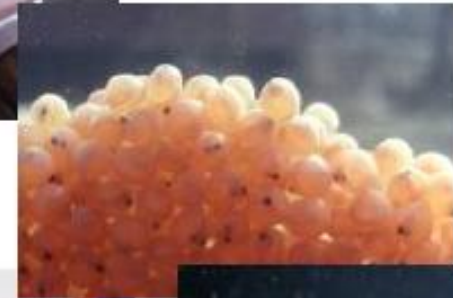
- The fish ladder is 300 metres long and also incorporates the option of moving smolt, or fish larvae, downstream to reach the Baltic Sea where they can grow and thrive. The option of moving smolt downstream is unique and the first of its kind in Europe.



The natural reproduction of salmon and sea trout stops when rivers are regulated and used to generate hydro power. Swedish power companies are therefore ordered to compensate for the decline by breeding fish.

Results

- Vattenfall is the largest cultivator of fish in Sweden
- About 1.3 million fish are released into the regulated rivers every year.
- In an additional voluntary project in co-operation with the city of Stockholm, Vattenfall releases 150 000 salmon and sea trout in central Stockholm and in the Stockholm archipelago.



Vattenfall is currently managing one of the largest watercourse renaturation projects in the state of Brandenburg in Germany. The renaturation project is taking place as a compensation for use of the Lakoma pond area by the Cottbus North open cast lignite mine.

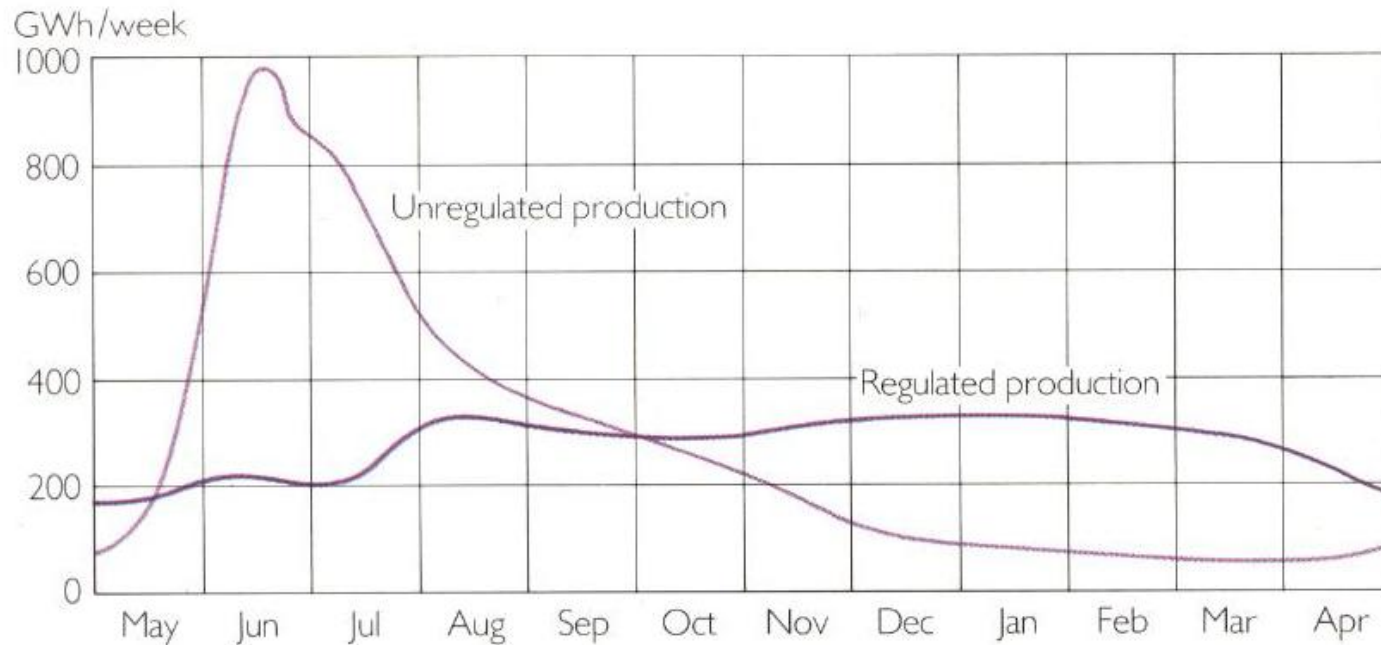
The work will take place in stages until 2011. It involves developing vegetation typical of a river floodplain on a surface covering 400 hectares under a 10 kilometre section of the river.

Results

- The Spree and it's floodplains will return to a more natural state and self-regulating systems will evolve.
- New habitats are being formed in areas behind the dykes.
- A retention area that will be planted with woody shrubs such as willow. Alder and elm is created.
- As a result, visitors have begun using the area for walking and cycling.



Example storage consequence for river flow



Unregulated and regulated production in the river Lule älv (mean value of three consecutive years).



Vattenfall officially commissioned Europe's largest fish ladder on the Holstein (northern) side of the Elbe river in Germany in September 2010. The 550 metre long waterway consists of 45 pools.

- A further four stairs have been constructed for eels.
- The fish ladder's measures were designed to allow migration of fish of up to 3,5 m length (largest species sturgeon).
- On the Niedersachsen (Southern) side of the Elbe, the weir is bridged by a smaller ladder, which was commissioned in 1997. It has a more natural design and allows 32 different species to migrate (at present there are 100 species)
- The performance of both the fish ladders are subject to extensive monitoring. Using transponders, it is possible to track and document the movement of the fish- the collected data is a valuable research asset.